Novel cystatin of Trichinella spiralis (TsCstN) ameliorates ovalbumin (OVA)-induced lung inflammation in asthmatic mouse model

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Abstract

Asthma, a chronic disease affecting humans and animals, has recently become increasingly prevalent and steadily widespread. The alternative treatment of asthma using helminth infections or helminth-derived immunomodulatory molecules have been evaluated and demonstrated significant amelioration of disease severity index in vitro and in vivo. Trichinella spiralis, a parasitic nematode and its immunomodulatory molecules elicit a potential to relieve asthma and other immune-related disorders. Herein, we investigated the immunomodulatory function of recombinant T. spiralis novel cystatin (rTsCstN) in ameliorating acute inflammatory asthma disorders in murine model. Female BALB/c mice were sensitized using intraperitoneal injection of ovalbumin (OVA)/alum and subsequently challenged with intranasal administration of OVA alone or OVA + rTsCstN for three consecutive days, producing OVA-induced allergic asthma models. To evaluate the therapeutic efficacy of rTsCstN, the inflammatory cells and cytokines in bronchoalveolar lavage fluid (BALF) and OVA-specific Immunoglobulin E (IgE) levels in serum, were assessed. Histological alterations in the lung tissues were determined by hematoxylin/eosin (H&E) staining and eventually scored for the extent of inflammatory cells infiltration. The asthma mouse models challenged with OVA + rTsCstN demonstrated a significant reduction of eosinophils ($p < 0.01$), macrophages ($p < 0.05$), and cytokines tumor necrosis factor (TNF)-α ($p < 0.05$) and interferon (IFN)-γ ($p < 0.05$) in BALF when compared with the mice challenged with OVA alone. However, the levels of interleukin (IL)-4 and IL-10 remained unaltered. Histological examination revealed that the mice administered OVA + rTsCstN were less likely to have inflammatory cell infiltration in their perivascular and peribronchial lung tissues than those administered OVA alone. rTsCstN demonstrated immunomodulatory effects to reduce severe pathogenic alterations in the asthma mouse models, encouraging a viable alternative treatment for asthma and other immunoregulatory disorders in humans and animals in the future.

Keywords: asthma; novel cystatin (TsCstN); Trichinella spiralis; immunomodulatory molecule